GTE-ERS
TECHNICAL LIBRARY
03681

NORTHEAST ELECTRONICS

A DIVISION OF NORTHERN TELECOM, INC.

INSTRUCTION MANUAL

MODEL 8674
SIGNALING ADAPTER

No. A0086-74-600 ISSUE 1 DATE MAY 1975

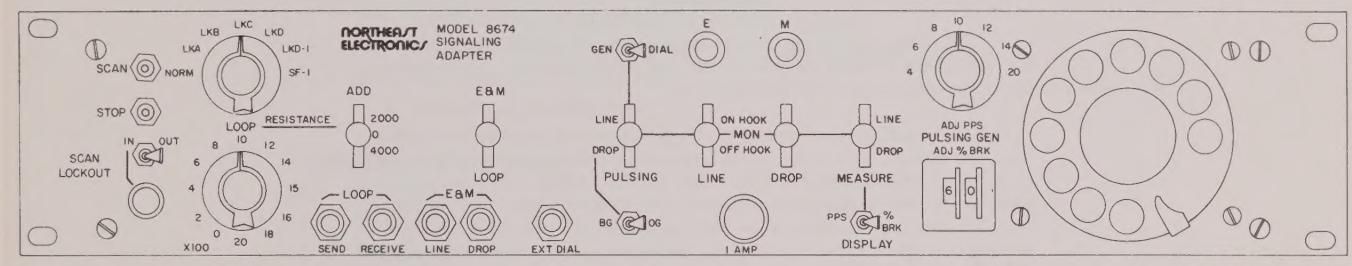
PRINTED IN U.S.A.

Airport Rd., Concord, N.H. 03301 • (603) 224-6521 • TELEX 94-3453

1.0C-8674-0575

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_08190



01087

NORTHEAST ELECTRONICS

A DIVISION OF NORTHERN TELECOM, INC.

INSTRUCTION MANUAL

MODEL 8674
SIGNALING ADAPTER

No. A0086-74-600 ISSUE 1 DATE MAY 1975

PRINTED IN U.S.A.

1.0C-8674-0575

R. L. ARTMAN

PROPRIETARY NOTICE

The information contained in this publication is the property of Northeast Electronics Corporation and may not be reproduced or used for manufacturing purposes or disclosed to third parties without the written permission of Northeast Electronics Corporation.

WARRANTY

NEC warrants all products manufactured or sold by NEC to be free from defects in materials and workmanship, subject to the following terms and provisions.

NEC's obligations under this warranty are limited to repairing, adjusting, or replacing at our option, with reasonable promptness, any NEC product which shall within twelve (12) months after delivery to the original purchaser, and after normal and proper usage, prove to be defective on NEC inspection, provided that the purchaser shall have reasonably inspected products when received and notified NEC of any apparent defects discovered within fifteen (15) days of receipt of shipment. NEC shall not be liable for any manufacturing costs of the buyer, lost profits or good will of the buyer, or any other special or consequential damages sustained or expenses incurred by the buyer by reason of the use or sale of any defective NEC product.

No products may be returned to NEC except with our written permission. After receiving NEC factory authorization, material requiring repair or replacement should be sent prepaid to the factory accompanied by a written statement setting forth as completely as possible the defects and the conditions under which they occurred. Material delivered by NEC shall not be considered defective if it satisfactorily fulfills the buyer's performance requirements and/or is in accordance with approved samples. NEC's obligations on performance of products delivered shall be limited to complying with specifications accompanying a purchase order or with published specifications on standard catalog items. This warranty does not extend to any NEC products which have been subject to misuse, neglect, accidents or improper installation or applications, nor shall it extend to units which have been repaired or substantially altered outside the NEC factory, nor to any associated instruments, equipments or apparatus. This warranty is in lieu of all other warranties, express or implied.

TABLE OF CONTENTS

SECTION		PAGE
1	**DESCRIPTION**	1–1
	1.1 Introduction	1–1
2	**SPECIFICATIONS**	2–1
	2.1 Introduction	2–1
3	**INSTALLATION AND OPERATION**	3–1
	3.1 Introduction	3–1
	3.3 Installation Instructions	3–1
	3.4 Model 8674 Interconnection to 8600 System	3–1
	3.7 Model 8674 Interfacing with Customer-Supplied Power	3–1
	3.9 Pre-Operative Instructions	3–1
	3.12 Operating Procedures	3–1
4	**CIRCUIT DESCRIPTION**	4–1
	4.1 Introduction	4–1
	4.4 Send Section	4–1
	4.12 Receive Section	4–2
	4.14 E Lead Measurements	4–2
	4.16 Loop Measurements	4–3
	4.18 M Lead Measurements	4–3
	4.20 Interfacing and Interconnection to 8600 System	4–3
	4.21 Opto-Isolator Interface	4–3
	4.24 Pulse Converter	4–3
	4.26 Function Connections	4–3
5	**MAINTENANCE AND CALIBRATION**	5–1
	5.1 Introduction	5–1
	5.4 Service Information	5–1
	5.6 Test Equipment	5–1
	5.8 Maintenance	5–1
	5.10 Access and Disassembly Procedure	5–1
	5.12 Troubleshooting Procedures	5–2
	5.14 Send Section	5–2
	5.16 Receive Interconnection and Opto-Isolator Interface Circuits	5–2
	5.22 Calibration Procedure	5–5
	5.23 Pulse Generator Calibration	5–5
	5.26 Pulse Converter Calibration	5–6
	5.28 A Relay Calibration	5–6
6	**ELECTRONIC PARTS LIST**	6–1
	6.1 Introduction	6–1
7	**SCHEMATIC DIAGRAMS**	7–1
	7.1 Introduction	7–1

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
3–1	Model 8674 Controls, Indicators and Connectors	3–3
3–2	Model 8674 Interconnection to 8600 System and Customer-Supplied Power	3–6
4–1	Model 8674 Overall Block diagram	4–1
5–1	Model 8674 Pulse Converter Logic Diagram	5–4
5–2	Model 8674 Test Equipment Return Lead Connection Points	5–5
5–3	Model 8674 Pulse Generator Calibration Controls and Test Point Location Diagram.	5–7
5–4	Model 8674 Pulse Converter Calibration Controls and Test Point Location Diagram.	5–7
6–1	Model 8674 PC1 Line and Generator Board Assembly 96609 Parts Location Diagram.	6–3
6–2	Model 8674 PC2 Resistor Board Assembly 96260 Parts Location Diagram	6–5
6–3	Model 8674 PC3 Interface Board Assembly 96254 Parts Location Diagram.	6–7
6–4	Model 8674 PC4 BCD Switch Assembly 96261 Parts Location Diagram.	6–8
7–1	Model 8674 Overall Schematic Diagram	7–2
7–2	Model 8674 Interfacing Circuit Schematic Diagram	7–3

LIST OF TABLES

TABLE	TITLE	PAGE
2–1	Model 8674 Specifications	2–1
3–1	Model 8674 Controls, Indicators and Connectors	3–2
3–2	Model 8674 Loop and E&M Send and Receive Functions	3–4
5–1	Recommended Test Equipment	5–1
5–2	Model 8674 Pulse Generator Calibration Control Settings	5–6
5–3	Model 8674 A Relay Pulse Readings	5–7
6–1	Model 8674 Overall Parts List	6–1
6–2	Model 8674 PC1 Line and Generator Board Assembly 96609 Parts List	6–2
6–3	Model 8674 PC2 Resistor Board Assembly 96260 Parts List	6–4
6–4	Model 8674 PC3 Interface Board Assembly 96254 Parts List	6–6
6–5	Model 8674 PC4 BCD Switch Board Assembly 96261 Parts List	6–8
6–6	Model 8674 Cable Assembly B0086-74-010 Parts List	6–8
6–7	Model 8674 Harness Layout Assembly C0086-74-012 Parts List	6–8

SECTION 1

DESCRIPTION

1.1 INTRODUCTION.

1.2 The Northeast Electronics Model 8674 Signaling Adapter is designed to be used in conjunction with the Model 8600 Transmission Measuring System to perform signaling tests on loop and E&M signaling circuits. Both send and receive signaling capabilities are incorporated within the Model 8674 Signaling Adapter.

1.3 In the send mode, either manual pulsing or continuous precision dial pulsing at variable speeds and percent break can be selected. Selection of dry loop signaling or E&M lead signaling is provided on the front panel. Operation in the send mode is independent of the CME (Common Measuring Equipment).

1.4 In the receive direction, measurements of pulse speed or percent break can be made in either the STOP or SCAN mode with measurement results displayed on the 8600 System readouts. STOP, SCAN and SCAN LOCKOUT controls are located on the Signaling Adapter front panel along with E&M indicator lamps that give visual indications of line supervision and pulses received.

1.5 Access to the input and output circuitry of the Signaling Adapter is via front-panel-mounted 310-type phone jacks. An external dial jack is also included. Model 8674 Signaling Adapters can be series-multipled to provide signaling tests at numerous locations. Interconnection between the CME and other accesses is via the standard Model 8657 Cable Assembly.

1.6 Front panel height is 3-1/2 inches. Panel width allows for mounting in a standard 19-inch relay rack. Panel adapters are available for mounting the Model 8674 in 23-inch, 27-1/2-inch and 30-inch racks.

SECTION 2

SPECIFICATIONS

2.1 INTRODUCTION.

2.2 Model 8674 Signaling Adapter specifications are listed in Table 2—1.

Table 2—1. Model 8674 Specifications.

RECEIVE DIRECTION	
Dry Loop:	The internal A relay is set to 14.4 mA in the not operate mode and 14.8 mA in the operate mode.
E&M:	
20% to 80% break at 10 pulses per second:	± 0.3 % break.
4 pps to 24 pps at 20% to 80% break:	± 0.5 pps.
Percent break resolution:	0.1% break.
Pulses per second resolution:	0.1 pps.
Number of pulses sampled per reading:	Pulse speed times 0.5.
Number of pulses required per measurement period (% break or pps):	At 4 pps, 3 pulses minimum. At 20 pps, 12 pulses minimum.
SEND DIRECTION	
Dial Pulse Generator:	
Loop or E & M:	
% break range:	0% to 100% break.
% break accuracy, 5% to 95% break:	± 1% break.
% break resolution:	1% break.
Pulse speed range:	4, 6, 8, 10, 12, 14, 20 pps.
Pulse speed accuracy, 4 pps to 20 pps:	± 0.5 pps.
External Pulsing Source Limitations:	5% to 95% break from 0 pps to 20 pps. Dry contacts only. Source must be insulated from C.O. ground and C. O. battery.
POWER REQUIREMENTS	
Voltage:	42 Vdc to 56 Vdc, 48 Vdc (nominal) C. O. battery. Internally fused at 1 Ampere. Polarity reversal protection provided.

Table 2—1. (cont'd)

OPERATING TEMPERATURE	
Range:	30°F to 122°F (0°C to 50°C).
PHYSICAL	
Size:	19-in. w x 3-1/2-in. h x 6-15/16-in. d (48.3 cm x 8.9 cm x 17.6 cm).
Weight:	9 pounds (4.1 kg).

SECTION 3

INSTALLATION AND OPERATION

3.1 INTRODUCTION.

3.2 Instructions necessary for interconnecting the Model 8674 Signaling Adapter with the Model 8600 Transmission Measuring System are presented in paragraphs 3.3 through 3.6. Set-up, pre-operative and operating procedures begin with paragraph 3.7. Figure 3—1 and Table 3—1 indicate and describe, respectively, the controls, indicators and connectors of the Model 8674.

3.3 INSTALLATION INSTRUCTIONS.

NOTE

Because of the possibility of changes caused by vibration during shipment, it is suggested that the internal A relay be checked and recalibrated, if necessary, before installation of the Signaling Adapter. Refer to Section 5 of the manual for access and disassembly instructions and the A relay calibration procedure.

3.4 MODEL 8674 INTERCONNECTION TO 8600 SYSTEM.

3.5 Refer to Figure 3—2. One Model 8657 Cable Assembly is required to connect the Model 8674 Signaling Adapter to the Model 8610A Common Measuring Equipment. This connection is made between interfacing jack J1 on the rear of the Model 8674 and one of the eight access connectors on the Model 8610A. Normally, the lowest numbered available access will be selected. The selected access connector on the 8610A will have a patch plug inserted into it. The patch plug must be removed in order to connect the Model 8657 Cable Assembly into the access connector. If two or more tandem connected Signaling Adapters are to share a single 8610A access connector, one Model 8657 Cable Assembly is required between jack J1 of each tandem Signaling Adapter and jack J2 of the next unit in the series.

NOTE

A patch plug must be inserted in connector jack J2 of the last adapter unit. A patch plug removed from the 8610A CME access connector can be used for this purpose.

3.6 When other types of units are to be connected in tandem, such as Model 8651, 8673, etc., the method of interconnection is the same as described for the Model 8674 units in tandem.

3.7 MODEL 8674 INTERFACING WITH CUSTOMER-SUPPLIED POWER.

3.8 Make sure that no plugs are inserted into any of the front panel jacks on the Model 8674. Refer to note 4 on Figure 3—2. Observing proper polarity, connect the —48 volt central office battery to terminal strip TS1 on the rear of the Signaling Adapter. Pin TS1-1 is connected to the ground terminal and pin TS1-2 is connected to the —48 volt terminal on the central office battery. If reversed battery connections are made, the Signaling Adapter will not operate because of the internal circuit protection against polairty reversal.

3.9 PRE-OPERATIVE INSTRUCTIONS.

3.10 General. The Model 8674 Signaling Adapter is designed to test dry loop or E & M signaling circuits. Each mode features independent send and receive capability. The pulse generator provides a source of continuous dial pulses with adjustable percent break and pulse speed, or manual trains of non-adjustable pulses controlled by the panel-mounted dial. Provision is made to control the pulse generator output with an external dry circuit driver. Specifications given in Section 2 should be consulted for limits on external driver usage. Access to the internal circuits is via the Model 8674 front panel jacks for 310-type phone plugs. Facility for scan and stop control of the 8600 System are provided on the Model 8674 Signaling Adapter. Refer to Figure 3—1 for location and Table 3—1 for function of the front-panel-mounted controls, indicators and connectors.

3.11 Two-conductor tip and ring type test cords are sufficient for all send and receive tests. All cords should be equipped with a 310-type plug on the end toward the Signaling Adapter. For tests on E & M, the test cord may be a 310-type twin plug. Model 8674 Loop and E & M Send & Receive functions listed in Table 3—2 will help in understanding the operating procedures provided in the following paragraphs. In addition, once the procedures are understood, Table 3—2 can be used as a short-form set-up and method of procedure for the different modes of operation.

3.12 OPERATING PROCEDURES.

3.13 Loop Receive (Dry Loop Only). It is assumed that the loop circuit to be checked has been turned down to traffic. Refer to Table 3—2 for appropriate control settings and jack connections. Since all loop measurements are made through the Model 8674 internal A

Table 3—1. Model 8674 Controls, Indicators and Connectors.

REF DES	CONTROL,INDICATOR OR CONNECTOR	FUNCTION
DS1	E lamp	Supervisory lamp. Indicates busy (extinguished lamp) or idle (lighted lamp) on line circuit when supervision is on circuit.
DS2	M lamp	Supervisory lamp. Indicates busy (extinguished lamp) or idle (lighted lamp) on drop circuit when supervision is on circuit.
DS3	SCAN LOCKOUT indicator lamp	Lamp indicates when Signaling Adapter has SCAN LOCKOUT switch activated.
F1	Fuse	One Ampere fuse protection for Signaling Adapter.
J1	LOOP SEND jack	Loop signaling jack.
J2	LOOP RECEIVE jack	Loop signaling jack, connected to internal A relay.
J3	E & M LINE jack	Send and receive jack for E & M signaling.
J4	E & M DROP jack	Send and receive jack for E & M signaling.
J5	EXT DIAL jack	Connection for external dial or other pulsing source to drive internal pulsing relay.
S1	E & M/LOOP key	Selects mode of operation for dry loop or E & M signaling circuits.
S2	PULSING key switch	Connects pulsing relay to Line M lead or to Drop E lead.
S3	LINE key switch	Connects on-hook and off-hook supervisory signals toward line when operated and allows monitor (MON) measurements in the center position.
S4	DROP key switch	Connects on-hook and off-hook supervisory signals toward drop when operated and allows monitor (MON) measurements in the center position.
S5	MEASURE key switch	Connects measure circuits to the Line E or to Drop M lead.
S6	BG/OG toggle switch	Selects battery and ground or open and ground signaling when pulsing Drop E lead.
S7	GEN/DIAL toggle switch	Selects continuous pulsing from internal generator or manual pulsing from the panel-mounted dial.
S12	ADD key switch	Associated with RESISTANCE switch. Increases loop resistance by 2000 or 4000 ohms for maximum total of 6000 ohms.

Table 3—1 (cont'd)

S13	LEAK rotary switch	Connects one of six standard resistive-capacitive networks between any inserted loop resistance and the pulsing relay.
S14	LOOP RESISTANCE rotary switch	Provides balanced loop resistance from 0 to 2000 ohms in 200-ohm increments (except 100-ohm steps for 1400 ohms through 1600 ohms).
S15	DIAL rotary pulsing switch	Manual pulse train control.
S16	ADJ % BRK digital thumbwheel switch	In continuous pulsing mode, selects percent break of transmitted pulses supplied by internal pulsing generator.
S17	ADJ PPS rotary switch	In continuous pulsing mode, selects pulse rate of transmitted pulsing generator.
S18	DISPLAY toggle switch	Selects measurement of pulse speed or percent break on 8600 System readout.
S19	SCAN pushbutton switch	Returns 8600 System to SCAN mode from STOP mode (momentary contact switch).
S20	STOP pushbutton switch	Places 8600 System in STOP mode when depressed at the time a measurement is made at respective access (momentary contact switch).
S21	SCAN/LOCKOUT toggle switch	Locks 8600 System in STOP mode at respective access.

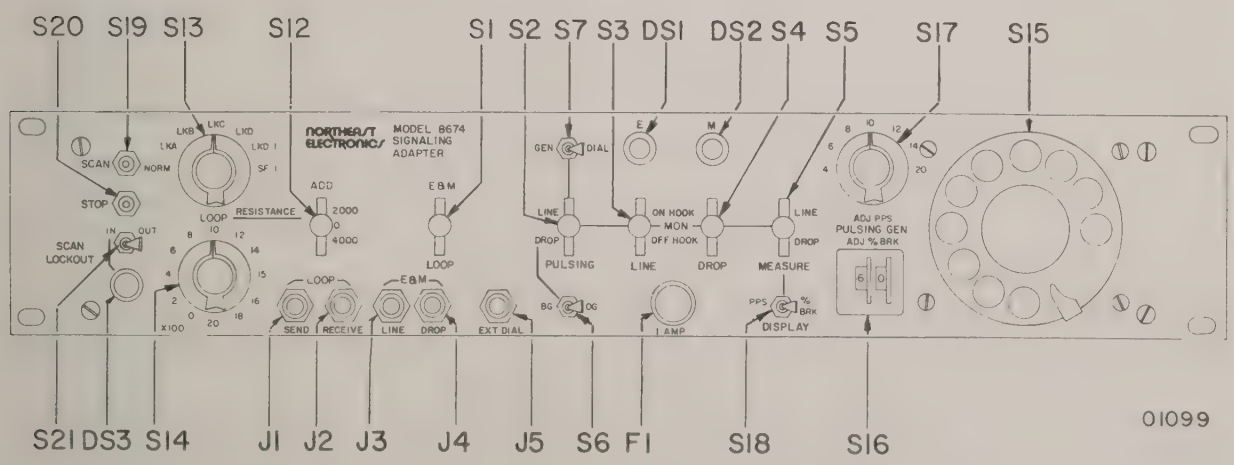


Figure 3—1. Model 8674 Controls, Indicators and Connectors.

Table 3—2. Model 8674 Loop and E & M Send and Receive Functions.

TEST MODE	SET SWITCH	TO SWITCH POS	TYPE/SIGNALING	USE JACK
LOOP RECEIVE	E & M/LOOP (S1)	LOOP	DRY LOOP	LOOP RECEIVE (J1)
LOOP SEND	E & M/LOOP (S1)	LOOP	DRY LOOP	LOOP SEND (J2)
E & M MONITOR	E & M/LOOP (S1)	MON	GND & OPEN, GND & BAT, BAT & OPEN, BAT & GND	LINE (J3) or DROP (J4)
	PULSING (S2)	MON		
	LINE (S3)	MON		
	DROP (S4)	MON		
	MEASURE (S5)	MON		
E & M toward the LINE	E & M/LOOP (S1)	E & M	Receive: GND & OPEN, GND & BAT; Send: BAT & GND	LINE (J3) and DROP (J4)
	PULSING (S2)	LINE		
	LINE (S3)	MON/OFF HOOK		
	DROP (S4)	(optional)		
	MEASURE (S5)	LINE		
E & M toward the DROP	E & M/LOOP (S1)	E & M	Receive: BAT & OPEN, BAT & GND; Send: GND & OPEN, GND & BAT	LINE (J3) and DROP (J4)
	PULSING (S2)	DROP		
	LINE (S3)	(Optional)		
	DROP (S4)	MON/OFF HOOK		
	MEASURE (S5)	LINE		
EXT DIAL				EXT DIAL (J5)

relay, tests can be made either before or after the office repeater. Scan or stop the 8600 System as desired. When measuring other than continuous pulsing in the scan mode, the pulse train must be initiated when the green ACCESS SERVED lamp on the display is lighted. Use the display switch to select measurements of pulse speed or percent break. The system readout will automatically display the selected type of measurement.

3.14 Loop Send (Dry Loop Only). It is assumed that the loop circuit to be checked has been turned down to traffic. Select as the source of dry loop pulsing either continuous, fully adjustable pulses from the internal generator or manual trains of non-adjustable pulses controlled by front-panel-mounted telephone-type dial switch S15. The pulsing contacts on SEND relay K1 are mercury-wetted and have permanent spark suppression to assure long contact life. If an external pulse source is used to drive the SEND relay, the pulsing contacts of this source must be dry and totally insulated from central office battery and ground. Consult Model 8674 specifications in Section 2 for limitations on external pulsing source usage. Select LEAK or LOOP resistance as needed. If the internal pulsing generator is to be used, set the required percent break and pulse speed. Immediately upon insertion of a plug into LOOP SEND jack J1, continuous pulsing will be present on the tip and ring contacts. If panel-mounted dial switch S15 is used, a continuous off-hook signal will be sent until the dial is activated.

3.15 Simultaneous Sending and Receiving. The Model 8674 Signaling Adapter can be used to send dry loop signals into one circuit while making measurements of incoming dry loop signals from another circuit. Simply combine the procedures presented in paragraphs 3.13 through 3.14 to accomplish this purpose.

3.16 E & M Signaling. For all E & M tests, set E & M LOOP key switch S1 to the E & M position. Verify that E & M supervision lamps DS1 and DS2 are functioning by inserting a 310-type dummy plug into either LINE jack J3 or DROP Jack J4. Both lamps should light regardless of the position of the PULSING, LINE, DROP or MEASURE key switches. Remove the dummy plug after verification of the supervision lamp.

3.17 Monitoring and Supervision. Prior to patching the line and drop jacks of a trunk to Signaling Adapter LINE and DROP jacks J3 and J4, return PULSING, LINE, DROP and MEASURE key switches S2 through S5 to the center MON position. Returning the test key switches to the normal monitor position will avoid the possiblity of interrupting a busy trunk line. In this monitor mode, the tip and ring of LINE jack J3 is connected to the tip and ring of DROP jack J4. After patching the trunk to be tested to the Model 8674 Signaling Adapter, observe LINE E and DROP M lamps DS1 and DS2 respectively, to determine if the trunk is idle or busy. Lighted lamps indicate idle trunk conditions. In the MON mode, the 8600 System measuring circuits are not activated and are available for measurements requested by other adapters.

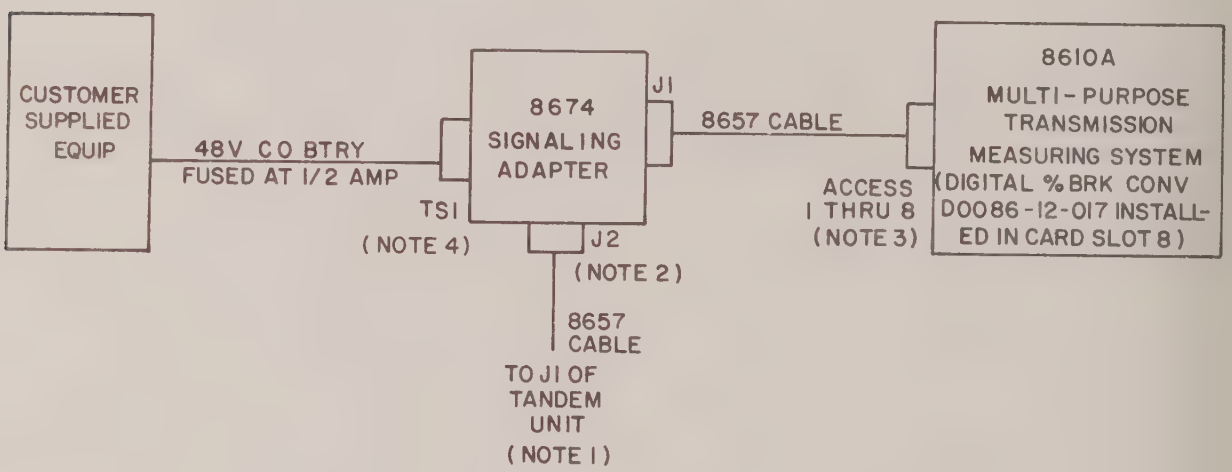
3.18 Measurements on E or M lead. Check E & M supervision lamp functioning as described in paragraph 3.16. It is assumed that the trunk to be tested has been turned down to traffic. Patch the trunk to the appropriate E & M jack(s) on the Signaling Adapter. Use DISPLAY toggle switch S18 to select the type of measurement to be made, either percent break (% BRK) or pulse speed (PPS). To measure ground and open or ground and battery pulses on the E lead, set MEASURE key switch S5 to the LINE position. This will automatically initiate the measure request to the 8600 System. Scan or stop the 8600 System as desired. In the SCAN mode, when measuring other than continuous pulsing, the pulse train must be initiated when the green ACCESS SERVED lamp on the display is lighted. To measure battery and open or battery and ground pulses on the M lead, set MEASURE key switch S5 to the DROP position. The requirements and results previously described for E lead measurements also apply for M lead measurements. DISPLAY toggle switch S18 may be set at will to change from percent break to pulse speed measurements. The change from one test mode to the other will be reflected on the display following the next complete measurement after setting the DISPLAY switch.

3.19 Sending on the E or M lead. Read and apply supervision lamp check procedure described in paragraph 3.16. It is assumed that the trunk to be tested and measured has been turned down to traffic. Patch the trunk to the appropriate E & M jacks on the Signaling Adapter. Select either continuous, fully-adjustable pulses from the internal generator, or manual trains of non-adjustable dial-controlled pulses as the pulse source. An external source can be used to drive send relay K1 via EXT DIAL jack J5 if the pulsing source contacts are dry and totally isolated from central office battery and ground. Consult the Model 8674 specifications in Section 2 for external pulse source limitations. If the internal pulsing generator is to be used, set the required percent break and the pulse speed. To send battery and ground pulses on the M lead, set PULSING key switch S2 to the LINE position. To send pulses on the E lead, set PULSING key switch to DROP position. Select battery and ground, or open

and ground, on the E lead with BG/OG toggle switch S6. In the send mode, the 8600 System measuring circuits are not activated and are available for measurements requested by other accesses or adapters.

3.20 Sending Supervisory Signals. If the trunk under test is patched through the LINE and DROP jacks of the Model 8674 and the adapter is sending on the line M lead, the trunk can be made busy toward the drop by setting DROP key switch S4 to the OFF HOOK position. Similarly, if sending on the drop E lead, the trunk can be made busy toward the line by setting LINE key switch S3 to the OFF HOOK position. In the ON HOOK position, both LINE key switch S3 and DROP key switch S4 supercede PULSING key switch S2 over control of the signaling leads. In the MON or OFF HOOK positions, the PULSING key switch supercedes the LINE and DROP key switches in the control of the signaling leads.

3.21 Simultaneous Sending and Receiving. The Model 8674 Signaling Adapter can be used to send dial pulse or supervisory signals into one circuit while making measurements of incoming signals from another circuit. Simply combine the procedures listed in paragraphs 3.18 through 3.20.


CUSTOMER SUPPLIED EQUIP
48V CO BTRY FUSED AT 1/2 AMP
TSI (NOTE 4)
8674 SIGNALING ADAPTER
J1
J2 (NOTE 2)
8657 CABLE
TO J1 OF TANDEM UNIT (NOTE 1)
8657 CABLE
ACCESS 1 THRU 8 (NOTE 3)
8610A MULTI-PURPOSE TRANSMISSION MEASURING SYSTEM (DIGITAL % BRK CONV D0086-12-017 INSTALLED IN CARD SLOT 8)

NOTES:

1. ADDITIONAL 8674 UNITS, 8650/8651 ACCESS & CONTROL PANELS, AND 8673 % BRK ADAPTERS MAY BE CONNECTED IN TANDEM
2. PATCH PLUG MUST BE INSERTED IN J2 OF SINGLE UNIT OR J2 OF LAST UNIT IN TANDEM. USE PATCH PLUG REMOVED FROM ACCESS CONNECTOR ON 8610A. PATCH PLUG NOT REQUIRED IF LAST UNIT IS AN 8650.
3. CONNECTORS J1, J2, J5, J6, J9, J10, J13, AND J14 RESPECTIVELY PROVIDE CONNECTION TO ACCESS SERVED 1 THRU 8 ON THE 8610A.
4. PIN TSI-1 IS GND CONNECTION
   PIN TSI-2 IS -48V CO BATTERY CONNECTION.

01085

Figure 3—2. Model 8674 Interconnection to 8600 System and Customer-Supplied Power.

SECTION 4

CIRCUIT DESCRIPTION

4.1 **INTRODUCTION.**

4.2 Circuit descriptions, the overall block diagram and the logic diagram in this section, together with the schematic diagrams in Section 7, provide all the necessary principles of operation for a basic understanding of the Model 8674 Signaling Adapter.

4.3 The Model 8674 circuitry, in addition to the regulator section that supplies power to the integrated circuits, consists of two operational sections: the send section from which test signals originate and the receive section where returned test signals are measured. Included in the Model 8674 are the interfacing and interconnections to the 8600 System.

4.4 **SEND SECTION.**

4.5 The send section provides generation and control of dial pulse signals that can be sent on loop or E & M circuits. GEN/DIAL toggle switch S7 is used to select the source of the signals. In the GEN position, internal digital pulse generator U1 through U5 produces continuous signals of which the percent break period and frequency are regulated by front panel ADJ % BRK switch S17 and ADJ PPS switch S16 respectively. Refer to Figure 7—1, the overall schematic diagram. U1 is an astable multivibrator with capacitor C4 and resistors R25 through R39 as the frequency determining components. The output of U1 is counted by cascaded decade counters U2 and U3. The BCD outputs of U2 and U3 are connected respectively to the A inputs of cascaded 4-bit magnitude comparators U4 and U5. The B inputs of U4 and U5 are connected to the BCD information provided by ADJ % BRK thumbwheel rotary switch S16. This BCD information represents the requested percent break as a two-digit number.

4.6 Pin 12, the A B output of magnitude comparator U5, is at a logic 1 level at the beginning of the count sequence. When decade counters U2 and U3 have accumulated a sufficient number of pulses from multivibrator U1 to cause the magnitude of the A data to equal the magnitude of the B data at both U4 and U5, the A < B output of U5 changes to a logic 0 level. This state remains until a total of 100 counts has been accumulated in U2 and U3. At the one hundredth count, the A data lines return to logic 0, the A< B output returns to logic 1 level and the sequence repeats.

4.7 The two-digit percent break number represents the total number of counts accumulated by U2 and U3

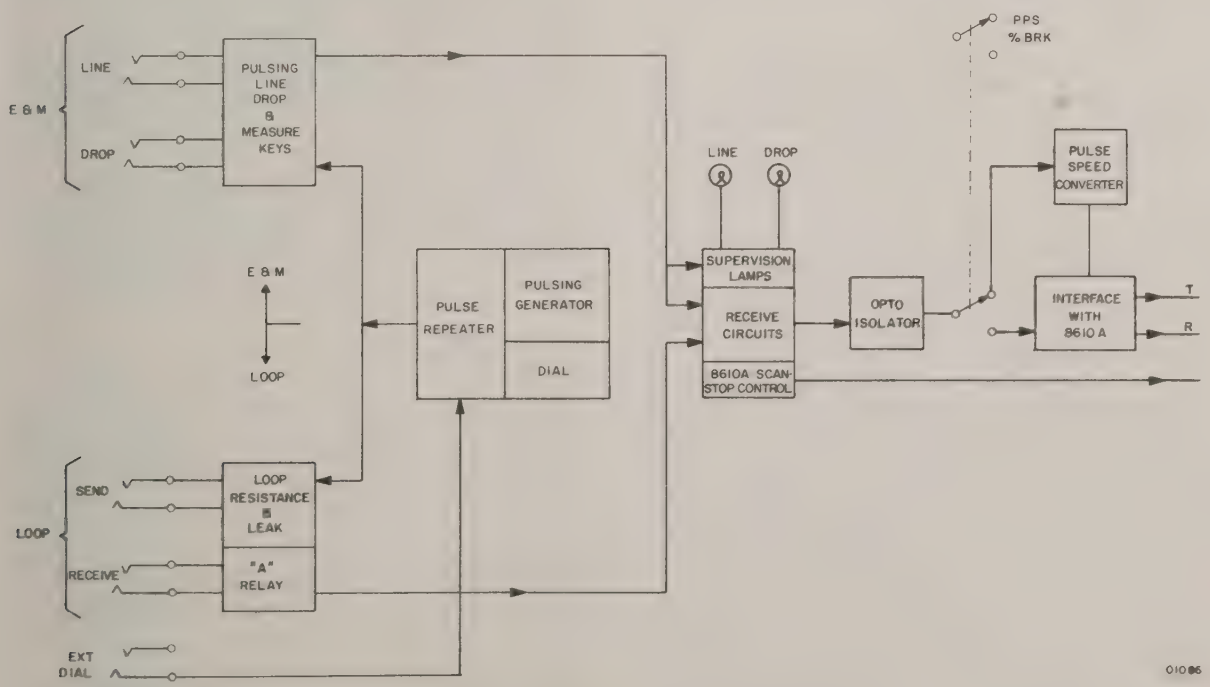


Figure 4—1. Model 8674 Overall Block Diagram.

before the A< B output of U5 changes from logic 1 to 0. The output pulse rate is determined by the frequency of U1 and is exactly 1/100 of that frequency.

4.8 The A< B output is buffered by transistor Q9 as it enters the pulse repeater circuit consisting of transistors Q10 through Q12 and send relay K1. Transistors Q11 and Q12 each drive one coil of K1 alternately with the changing state of the A< B output. With GEN/DIAL toggle switch S7 in the DIAL position, the same operational sequence is accomplished by either the making and breaking of the dial contacts, or the pulsing contacts of an external driver connected to the Model 8674 via EXT DIAL jack J5.

4.9 The send relay is a precision 1% balance bistable coil unit with mercury-wetted contacts. The coils are diode suppressed to protect transistors Q11 and Q12 from the voltage induced by collapsing relay coil fields. In addition, the pulsing contacts not only have resistive-capacitive spark suppressor protection, but also are limited to a peak of 450 volts by varistor RV1. This cirucitry protects the mercury relay contacts from damage induced by the collapsing fields of relays that are pulsed by these contacts.

4.10 The supply voltage for U1 through U5 is derived from the central office battery. The circuit common of this supply is referenced to the minus side of the central office battery. Transistor Q1 and zener diode CR7 comprise a series dropping regulator supply to bring the applied voltage within the maximun operating range of +5-volt regulator Q2.

4.11 Loop or E & M signals are connected to the appropriate jacks by the E & M LOOP, PULSING, LINE and DROP key switches in the following manner:

a. Loop: A pulsing or short is applied to the tip and ring contact terminals of LOOP SEND jack J1 via contacts on E & M/LOOP key switch S1 when the switch is set to the LOOP position. In this mode, any change of position of the PULSING, LINE, DROP and MEASURE key switches is irrelevant with respect to the LOOP circuit. LEAK and RESISTANCE rotary switches S13 and S14 are associated with the loop send function. The RESISTANCE switch inserts balanced loop resistances consisting of R1 through R22 between tip and ring contacts on LOOP SEND jack J1 and on send relay K1. The associated ADD key switch S12 provides either 2000 or 4000-ohms balanced resistance, if required, to provide a total LOOP RESISTANCE up to 6000 ohms. The LEAK control provides one of 6 available leak circuits consisting of C1, C2 and R23 through R27 between any inserted LOOP RESISTANCE and the SEND relay contacts.

b. E & M: Dial pulse signals are applied to LINE jack J3 or DROP jack J4 via contacts on the following key switches when the E & M/LOOP key switch is set to the E & M position:

1. Toward the LINE. Battery and ground signaling is applied to the M lead on the ring of the line jacks via contacts on E & M/LOOP, PULSING and LINE key switches, S1 through S3. Battery is supplied through resistance lamp RT2. When LINE key switch S3 is set to ON HOOK, pulsing on the M lead is replaced by a steady-state, on-hook signal.

2. Toward the DROP. Ground and open or ground and battery signaling is applied to the E lead on the tip of DROP jack J4 via contacts on E & M/LOOP, PULSING, and DROP key switches S1, S2, and S4. The type of signaling is selected by BG/OG switch S6 associated with the DROP side of PULSING key switch S2. Battery is supplied through resistance lamp RT2. When DROP key switch S4 is set to ON HOOK, pulsing on the E lead is replaced by a steady-state on-hook signal.

NOTE

In the ON HOOK position, both the LINE and the DROP key switches supercede the PULSING key switch in control of the signaling leads.

In the MON or OFF HOOK positions, the PULSING key switch supercedes the LINE and DROP key switches in the control of the signaling leads.

This combination of key switches and division of control functions facilitate the change from off-hook to pulsing in either direction while maintaining on-hook in the opposite direction.

4.12 **RECEIVE SECTION.**

4.13 The Receive section contains two circuits for the interconnection between loop and E & M circuits and the opto-isolator, which in turn interfaces with the Digital Percent Break Converter Card in the Model 8610A CME. These circuits utilize field effect (FET) transistors. When the Model 8674 is set up for E & M signaling, the bridging load impedance of the FETs is slightly greater than 100K ohms for minimum circuit disturbance of the E & M lines. However, when MEASURE key switch S5 is set for a measurement, the input impedance is reduced to approximately 400 ohms.

4.14 **E LEAD MEASUREMENTS.**

4.15 The circuit consisting of resistors R2 through R7 and transistors Q1,Q2 and Q3 is used for measurements on the LINE E lead. The tip contact on LINE jack J3 is connected to the circuit input via E & M/LOOP key switch S1. This circuit responds to signaling of ground and open or ground and battery. The output of this circuit is connected to the opto-isolator circuitry, which is described in paragraphs 4.20 through 4.22. The collector of Q2 also drives Q4 that enables LINE (E) supervision lamp DS1.

4.16 **LOOP MEASUREMENTS.**

4.17 The same circuit described in paragraph 4.14 is used for measurements on dry loop circuits. The tip and ring of LOOP RECEIVE jack J2 is connected to the center tap of A relay K1 that operates and releases in the presence of dry loop pulsing. When E & M/LOOP key switch S1 is set to the LOOP position, the armature contact of the A relay, alternately pulsing open and ground, is connected to the interconnection circuit input. Also, when key switch S1 is set to the LOOP position, the supervision lamps do not receive power and are thus disabled.

4.18 **M LEAD MEASUREMENTS.**

4.19 The circuit consisting of resistors R10 through R13 and transistors Q5 and Q6 is used for measurements on the DROP M lead. The ring contact on DROP jack J4 is connected directly to the input of this circuit, which in turn responds to signaling of battery and open or battery and ground. The output of this circuit is described more fully in paragraphs 4.20 through 4.22. The drain of Q5 also drives Q7 and Q8, which in turn enable DROP M supervision lamp DS2.

4.20 **INTERFACING AND INTERCONNECTION TO 8600 SYSTEM.**

4.21 **OPTO-ISOLATOR INTERFACE.**

4.22 The outputs of the two FET input circuits are connected to MEASURE key switch S5. Assuming that the E & M circuits are to be tested, the proper output is selected by setting the MEASURE key switch to the desired measurement direction. The output is immediately connected via E & M/LOOP key switch S1 to the emitter of the opto-isolator on interface board PC3. When measuring loop pulsing, the interconnection circuit output by-passes the MEASURE key switch and is connected to the opto-isolator via E & M/LOOP key switch S1.

4.23 The opto-isolator, shown on Figure 7–2, provides 2500 volts isolation between any circuit associated with the signaling leads and the tip-ring leads going to the Model 8610A CME. The signal at the emitter is a battery and open square-wave reproduction of the signaling pulse applied to the Model 8674 input. Resistor R1 limits emitter current to about 14 milliamperes. The opto-isolator detector drives buffer transistor Q1 which, on percent break measurements, acts as an open-collector driver on the ring lead to the Model 8610A. Transistor Q2 is a buffer/driver on the tip lead.

4.24 **PULSE CONVERTER.**

4.25 Refer to Figure 7–2. The digital percent break converter in the Model 8610A is also used to enable pulse speed measurement. When DISPLAY switch S18 is set to the PPS position, pulse converter U2 and U3 on the interface board is connected between the collector of buffer transistor Q1 and thr ring lead. U2 and U3 convert the frequency of pulses received from Q1 to equivalent percent break pulses. U2A and U2B are monostable multivibrators. The pulse-width-determining components for the two multivibrators are C1, R6 and R7 and C2, R8 and R9 respectively. Q2 and U3A are open-collector drivers on the tip and ring leads. The pulse converter derives power from the Model 8610A.

4.26 **FUNCTION CONNECTIONS.**

4.27 Refer to Figure 7–2. When a measurement is requested by either setting MEASURE key switch S5 for E & M or inserting a plug into LOOP RECEIVE jack J2, six-contact relay K1 on the interface board is activated. This disconnects the measure percent break request, +5 Vdc, tip and ring control lines from jack J2 and any succeeding accesses or adapters, thereby giving measurement priority to the adapter being used. The tip,ring, and +5 Vdc are connected to the interface circuit and the measure request line is connected to +5V through resistor R13. In addition, the control line to the STOP and SCAN LOCKOUT switches is connected to +5v through resistor R15. This allows the scan to be stopped at the adapter when the system recognizes a request for measurement if either the STOP or SCAN LOCKOUT switch is depressed.

SECTION 5

MAINTENANCE AND CALIBRATION

5.1 INTRODUCTION.

5.2 This section contains the preventive and corrective maintenance and the calibration instructions required to ensure proper operation of the Model 8674 Signaling Adapter. Maintenance information is covered in paragraphs 5.8 through 5.21. Calibration procedures start with paragraph 5.22.

5.3 A review of the operation procedures and circuit theory discussed in Sections 3 and 4 respectively will be of indispensable aid in analyzing service problems.

5.4 SERVICE INFORMATION.

5.5 Each instrument manufactured by Northeast Electronics is warranted for a period of one year upon delivery to the original purchaser. Complete warranty information is located on the rear of the title page of this manual. Note that written authorization is required prior to return of any equipment for factory repairs. Additional service information can be obtained by contacting Northeast Electronics, Customer Service Department, P.O. Box 649, Concord, New Hampshire, 03301, telephone number 603-224-6521.

5.6 TEST EQUIPMENT.

5.7 Equipment recommended for calibrating and troubleshooting the Model 8674, together with the minimum specifications required for each instrument, is listed in Table 5—1. If the recommended equipment is not available, other equipment meeting the indicated minimum specifications may be used.

5.8 MAINTENANCE.

5.9 Other than periodic cleaning of jack contacts, the Model 8674 requires no routine preventive maintenance.

NOTE

Before proceeding to troubleshoot any circuitry, it is recommended that the central office battery voltage and polarity be checked to avoid otherwise unnecessary steps. The checks and procedures called for in this section assume a battery supply of —48 volts. In this part of the maintenance section, unless otherwise specified, voltages readings are to be taken between the referred point and central office ground.

5.10 ACCESS AND DISASSEMBLY PROCEDURE.

5.11 To obtain access to the components and circuit boards in the Model 8674, first remove the binder head screw on the front panel between E & M supervision

Table 5—1. Recommended Test Equipment.

TEST EQUIPMENT	REQUIRED SPECIFICATIONS	RECOMMENDED EQUIPMENT
VOM	Accuracy: 1.5% full scale. Input Impedance: 20K ohms per volt.	Triplett Model 630NA.
Oscilloscope	Vertical Sensitivity: 0.1 volt per cm minimum. Sweep Speed: 100 msec per cm minimum. Probe: X1.	Tektronix 504.
Frequency Counter	Accuracy: ± 1 count, including time base accuracy.	Northeast Electronics TTS 80C Frequency Counter.
Current Flow Test Set	15 mA ± 2% full scale.	Northeast Electronics TTS 77 Current Flow Test Set.

lamps DS1 and DS2. Then remove the six 4-40 flat head screws securing the cover plate. The cover plate is now free to be removed from the Model 8674 cabinet. Note that the three circuit boards located toward the rear of the chassis are each held in position by pairs of extruded card guides. This will allow easy test and/or replacement of board-mounted components and access to switch terminals for circuit tracing, in the event of circuit troubles.

CAUTION

The small circuit board located near the left rear corner of the Model 8674 is secured in place by four pairs of 2-56 fillister head screws via the mounting holes of system interfacing jacks J1 and J2 that are soldered to the board. These 8 screws must first be removed before attempting to remove the circuit board. Ensure that the screws are replaced after returning the board to the Model 8674 to avoid the possibility of damaging the board and/or creation of short circuits within the instrument.

5.12 TROUBLESHOOTING PROCEDURES.

5.13 If a malfunction occurs in the use of the Model 8674, it usually can be traced to one of three systems as follows:

a. Pulse generator, pulse repeater and send relay.

b. Interconnection and opto-isolator interface circuits.

c. Pulse converter.

5.14 SEND SECTION.

5.15 If it is determined that the Signaling Adapter is being operated properly according to instructions given in Section 3 but the dial pulses are not present at the appropriate send jacks, perform the following steps until the trouble is located:

a. With an oscilloscope, trace circuit path through key switch contacts back to the send relay contacts. For assistance in tracing this circuit and other Model 8674 circuits, refer to parts location diagrams in Section 6 and schematic diagrams in Section 7. Refer to Figure 5—2 for test instrument return lead connections when checking the various stages.

b. Using an oscilloscope (with oscilloscope return lead referenced to circuit ground) observe pulsing on collectors of transistors Q11 and Q12 on PC1 (96609). Pulsing should be between —48V and – 24V. If this amount of pulsing voltage is present, check continuity of send relay coils and resistor R43 on the circuit board.

CAUTION

From this part of the maintenance section until specified otherwise, the oscilloscope ground return lead is referenced to —48V central office battery and not to circuit or central office ground. In addition, the oscilloscope chassis and case must be isolated from NEMA ground and also any metal object that is common to central office ground. If this isolation is not performed, a short circuit will result. Do not attempt to make further measurements if the stated precautions cannot be guaranteed. Refer to Figure 5—2 for test instrument return lead considerations.

c. With a VOM, measure Vcc between pins 10 and 2 of jack J6 on PC1. This voltage should be +5 Vdc. If it is not present, check and compare voltages at pass transistor Q1 with the values given on Overall Schematic Diagram Figure 7—1 to determine the faulty component in the voltage regulator section.

d. Use oscilloscope to check for TTL pulsing at pin 12 of integrated circuit U5. If pulsing is present, trace it through pulse repeater transistors Q9 through Q12 and associated components.

e. Use oscilloscope to check for TTL pulsing at pin 3 of pulse generator U1. If pulsing is present, follow it through decade counters U2 and U3. Check pins 12, 9, 8 and 11 of both counters to verify presence of pulsing. If pulsing is not present at U1, measure voltage at U1 pin 6, referenced to pin 1. If no voltage is present at pin 6, check continuity of the resistive charge path and capacitor C4 before changing U1. If it is at +5 Vdc, check pin connections to U1 for continuity before changing the IC. U1 should be replaced only when it is certain that the IC is defective, inasmuch as replacement requires recalibration of pulse speed function.

f. If replacement of U1 restores pulsing, the pulse generator will require recalibration. Refer to paragraph 5.23 for pulse generator calibration procedure.

5.16 RECEIVE INTERCONNECTION AND OPTO-ISOLATOR INTERFACE CIRCUITS.

CAUTION

In this part of the Maintenance Section, unless otherwise specified, voltage readings are to be taken from indicated point referenced to central office ground.

5.17 Loop Receive. When receiving dry loop pulsing, internal A relay K1 should be audible while operating. If not, insert a dummy plug or open-ended cord into LOOP RECEIVE jack J2. With VOM, first measure −48V central office battery at tip contact of J2 and then measure dc continuity of approximately 200-ohms resistance from ring contact to central office ground. If these conditions are met, the source of trouble will be either external dry loop pulsing or the mechanical action of the internal A relay.

5.18 Line E Lead and Loop Interconnection Circuit. If it is determined that the measurement function on either the line E lead or the loop receive lead is not operating and it is known that the Signaling Adapter is being operated properly according to Section 3, perform the following steps until the trouble is located:

a. E Lead: Use oscilloscope to trace ground and open or ground and battery signaling along circuit path from E Lead jack J3 through the key switch contacts to pin 37 of jack J6 on PC1. When MEASURE key switch S5 is set to LINE position, it will be noted that ground and open signaling will appear to be ground and battery due to effect of resistor R28.

b. Loop: Use oscilloscope to trace circuit path from A relay contacts through the key switch contacts to pin 37 of jack J6 on PC1. Operating contacts on A relay will produce ground and battery signaling.

c. With VOM, measure dc voltage at anode of CR1 on PC1. Voltage should be −12v ± 5%. If not present, check continuity of resistor R1 and diode CR1.

d. With oscilloscope, check for ground and battery pulsing at collector of Q2. If not present, either transistor Q1 or Q2 may be defective.

e. With oscilloscope, check for battery and ground pulsing at collector of Q3. If not present, continuity of circuit through emitter of opto-isolator U1 on PC3 (96254) may be broken, or transistor Q3 may be defective.

f. If trouble is not yet located, refer to paragraph 5.20 for further steps.

g. Supervision Lamp. If LINE E lamp DS1 does not function when monitoring or making measurements on E lead and the lamp is not defective, make sure that E & M/LOOP key switch is set to E & M position. With VOM, measure voltage at pin 17 on PC1. If −48V is present, transistor Q4 may be defective.

5.19 Drop M Lead Interconnection Circuit. If it is determined that measurement function on drop M lead is not operating and it is known that Signaling Adapter is being operated properly as outlined in Section 3, perform the following steps until trouble is located:

a. Use oscilloscope to trace battery and open or battery and ground signaling along circuit path from M lead jack through the key switch contacts to pin 38 of jack J6 on PC1. When MEASURE key switch S5 is set to DROP, battery and open signaling will appear to be battery and ground due to effect of resistor R29.

b. With VOM, measure dc voltage at anode of diode CR1 on PC1. This voltage should be −12V ± 5%. If it is not present check continuity of resistor R1 and diode CR1.

c. With oscilloscope, check for battery and ground pulsing on collector of transistor Q6. If not present, continuity of the circuit through emitter of opto-isolator U1 on PC3 (96254) may be broken, or Q6 may be defective.

d. If trouble is not yet located, refer to paragraph 5.20 for futher troubleshooting steps.

e. Supervision Lamp. If DROP M lamp DS2 does not function when monitoring or making measurements on M lead and the lamp is not defective, make sure E & M/LOOP key switch is set to E & M position. With VOM, measure voltage at pin 12 on PC1. If −48V is present, transistor Q8 may be defective.

CAUTION

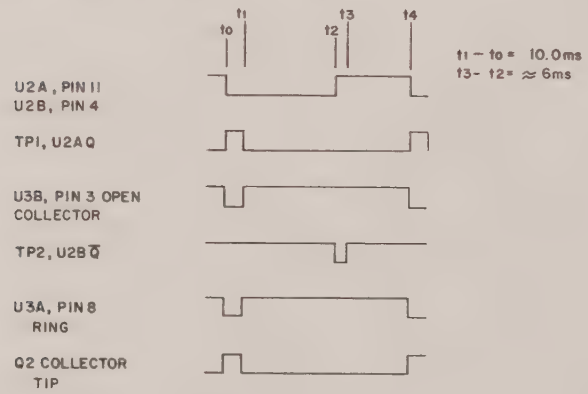
When servicing opto-isolator circuit, voltage readings are to be taken between designated point and 8600 System ground unless otherwise specified. To avoid ground loops this ground must not be connected to central office ground or NEMA ground at the Signaling Adapter location through any external equipment or wire straps. Refer to Figure 5—2 for test equipment return connections.

5.20 Opto-Isolator Interface. The opto-isolator interface circuit is located on PC3 (96254). If it is determined that receive measurement function is not operating but battery and ground pulsing is present at emitter input of opto-isolator, pin 9 on PC3, perform the following steps until the trouble is located. The 8610A CME must be in the STOP mode at the Signaling Adapter being serviced.

a. With VOM, measure incoming Vcc line. This voltage should be +5 Vdc ± 0.25 Vdc. If not present, trace Vcc line to 8600 System interfacing jack J1 and to 8610A if necessary.

b. Set DISPLAY toggle switch S18 to % BRK position and use oscilloscope to check for Vcc and ground pulsing at collector of transistor Q1. If not present, check pin 5 on pulse generator U1. This point should be pulsing between +0.3 V and + 0.7V. If not present at U1, check continuity of pin connections to U1 before attempting replacement. If pulsing is present at pin 5 of U1, lift collector of transistor Q1, let it float and measure the disconnected printed circuit lead for +5 volts ± 0.25 Vdc. If present, Q1 is probably shorted. If not present, trace circuit to 8600 System interfacing jack J1 and to 8610A, if necessary.

5.21 Pulse Converter. The pulse converter is located on PC3 (96254). If it is determined that the pulse speed measurement function is not operating but the percent break function does operate, perform the following steps until the trouble is located:



NOTE: LOGIC DIAGRAMS VALID FOR ANY SIGNAL WITHIN THE LIMITS: 20 TO 80% BRK 4 TO 24 PULSES PER SECOUND.

CAUTION

Unless otherwise specified, voltage readings in this section are taken between the designated point and the 8600 system ground. To avoid the possibility of creating ground loops, this ground must not be connected to central office ground through any external equipment or wire straps. Refer to Figure 5—2 for test instrument return lead considerations.

If operated in a noisy environment with the cover removed, improper operation will result because of the susceptability of this section to electrical noise pickup. Precautions are advised when troubleshooting this section. In no instance should the pulse converter be operated in the loop receive mode with the adapter cover removed.

a. Each half of U2 is retriggerable monostable multivibrator. With oscilloscope, check Vcc and ground pulsing at pin 11 of U2A. If not present, trace circuit path to Q1 collector.

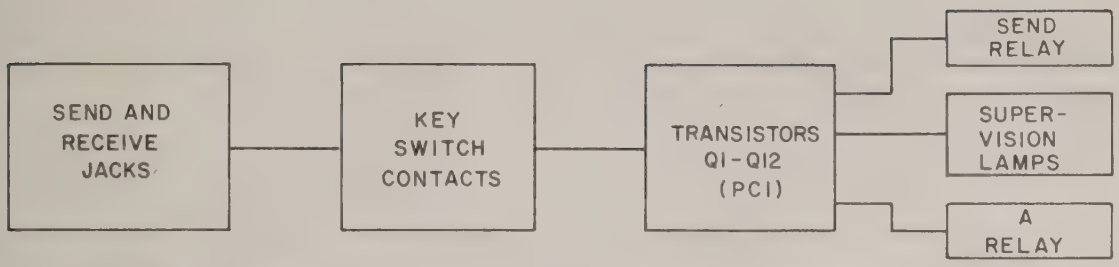
b. Use oscilloscope and logic diagrams shown on Figure 5—1 to determine if proper waveforms are present at terminals specified on logic diagram. Do not replace U2, (96L02), unless it is certain that it is defective, since replacement will necessitate recalibration. Recalibration will be required also if either C1 or C2 is replaced.

TIMING SEQUENCE:

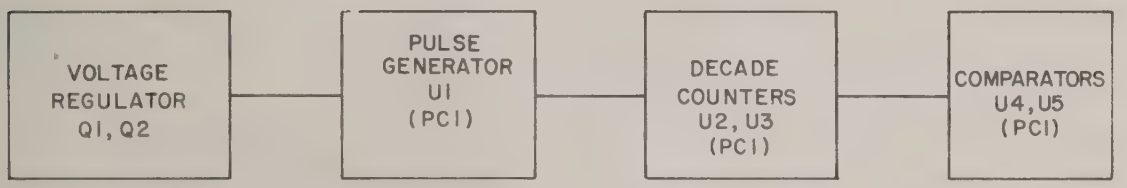
1. U2A Q OUTPUT IS TRIGGERED BY NEGATIVE EDGE AT t0 ON PIN 11. Q PULSE WIDTH = 10ms
2. U3B IS ENABLED, PREVENTING U2A FROM RETRIGGERING.
3. U2B Q̄ OUTPUT IS TRIGGERED BY FIRST POSITIVE TRANSITION AFTER t1 THEREBY PREVENTING U2A FROM TRIGGERING PREMATURELY. U2B WILL CONTINUE TO RETRIGGER IN THE PRESENCE OF CONTACT BOUNCE OCCURING AFTER t2. U2B Q̄ ALSO INHIBITS U3A.
4. U3A IS ENABLED ONLY WHEN U2A IS TRIGGERED.

01081

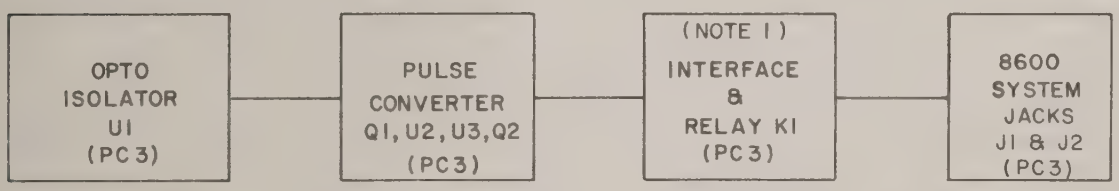
Figure 5—1. Model 8674 Pulse Converter Logic Diagram.



A. SEND/RECEIVE SECTIONS: RETURN LEAD TO CENTRAL OFFICE GROUND.



B. PULSE GENERATOR: RETURN LEAD TO −48V CENTRAL OFFICE BATTERY



C. OPTO-ISOLATOR AND INTERFACE: RETURN LEAD TO 8600 SYSTEM GROUND

01088

NOTES

1. REFERENCE RETURN LEAD TO C.O. GND WHEN TROUBLESHOOTING K1 FIELD COIL.

Figure 5—2. Model 8674 Test Equipment Return Lead Connection Points.

c. Refer to pulse converter calibration procedure starting in paragraph 5.26 if U2, C1 or C2 prove to be defective and require replacement.

5.22 CALIBRATION PROCEDURE.

5.23 **PULSE GENERATOR CALIBRATION.**

5.24 Connect a frequency counter, such as the Northeast Electronics Model TTS 80C, or its equivalent, to test point TP1 on PC3.

CAUTION

The frequency counter must be referenced to the −48V buss at the collector of transistor Q2. The same safety precautions apply to the frequency counter as was applied to the oscilloscope. Refer to Figure 5—2.

5.25 To activate the pulse generator, insert a dummy plug into either E & M jack, J3 or J4. The speed adjustment controls are mounted on the center circuit

board toward the rear of the Model 8674 as shown on Figure 5—2. Set PPS switch S17 to the desired position and adjust the corresponding calibration control (R25 through R31) to the frequency indicated in Table 5—2. Lock each control with glyptol or other nonpermanent sealer when calibration is completed. Remove the dummy plug to deactivate the pulse generator.

5.26 **PULSE CONVERTER CALIBRATION.**

CAUTION

Unless otherwise specified, voltage readings are to be taken between the specified point and the 8600 System ground. To avoid ground loops, this ground must not be connected to central office ground through any external equipment or wire straps. With the cover removed, this section of the adapter is susceptable to electrical noise pickup in a noisy environment resulting in improper operation. Precautions are advised when troubleshooting this section. In no instance should the pulse converter be operated in the loop receive mode with the Signaling Adapter cover plate removed. Refer to Figure 5—2 for test instrument return lead considerations.

5.27 The pulse converter is located on PC3, the printed circuit board located at the left rear corner of the Model 8674 chassis. The pulse converter calibration controls and test points are indicated on Figure 5—3. If recalibration of this circuit is required because of replacement of U2, C1 or C2, calibration controls R7 and R8 will set the 10-millisecond pulse time and the positive transition blanking respectively. The procedure is as follows:

a. Connect frequency counter such as Northeast Electronics TTS 80C (or equivalent) to test point TP1 on PC1.

b. Adjust calibration potentiometer R7 so that logic 1 pulse at TP1 is 10.00 ± 0.03 milliseconds in length. Refer to Pulse Converter Logic Timing Diagram, Figure 5—1.

c. Adjust calibration potentiometer R8 so that logic 0 pulse at test point TP2 is 6.00 ± 0.25 milliseconds in length. This completes the pulse converter calibration. Lock calibrated controls with glyptol or other nonpermanent sealer.

5.28 **A RELAY CALIBRATION.**

5.29 Should the A relay in the loop receive circuit be replaced or require calibration because of wear due to use, it may be returned to factory specification with the aid of the following procedure, making adjustments where necessary:

a. With A relay saturated, residual gap should measure 0.009 inch with feeler gauge.

b. With A relay saturated, check for approximately 0.0015 inch clearance between actuator and relay frame directly behind hinge.

c. To check contact operation, place feeler gauge between residual screw and relay core, and saturate relay. Check and adjust as follows:

1. Contacts 1 and 2: Check for no break with 0.007 inch gauge. Check for a break with 0.006 inch gauge. When adjusting, only bend actuator arm very slightly.

2. Contacts 2 and 3: Check for no make with 0.005 inch gauge. Check for a make with 0.004 inch gauge. When adjusting, bend only make contact spring (contact number 3).

Table 5—2. Model 8674 Pulse Generator Calibration Control Settings.

PPS SWITCH POSITION	CALIBRATION CONTROL	FREQUENCY
4	R25	400 HZ ± 2 HZ
6	R26	600 HZ ± 2 HZ
8	R27	800 HZ ± 2 HZ
10	R28	1000 HZ ± 2 HZ
12	R29	1200 HZ ± 2 HZ
14	R30	1400 HZ ± 2 HZ
20	R31	2000 HZ ± 2 HZ

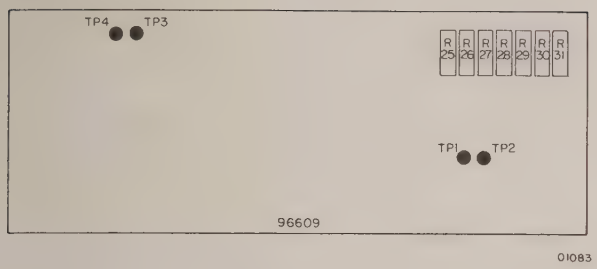


Figure 5—3. Model 8674 Pulse Generator Calibration Controls and Test Point Location diagram.

d. With relay released, check for 0.003 inch to 0.006 inch clearance between actuator arm and actuator back stop. When adjusting, bend only stop.

e. To margin A relay, current flow and adjust it, if necessary, by means of the following procedure. It is recommended that the Northeast Electronics TTS 77 Relay Current Flow Test Set, or its equivalent, be used as the calibration current source.

1. Using EXT BAT & GND, connect TTS 77, or its equivalent, to —48 volt power source.

2. Patch TTS 77 to A relay field coil.

3. Set number one and number two current circuits on TTS 77 to 15 mA range.

4. Adjust number one current circuit to 14.4 mA and number two current circuit to 14.8 mA.

5. Operate appropriate current circuits on TTS 77 and carefully adjust only the A relay moving armature contact spring for non-operate at 14.4 mA and just-operate at 14.8 mA.

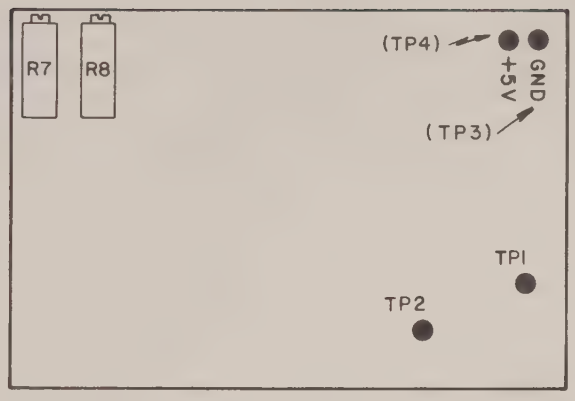


Figure 5—4. Model 8674 Pulse Converter Calibration Controls and Test Point Location Diagram.

f. Remove TTS 77 connections to the A relay and recheck the gauging steps if adjustments were made during margin test. Repeat above steps as necessary.when calibration adjustments are successfully completed, replace Model 8674 cover and binder head screws that secure it.

5.30 As an overall performance check of the A relay calibration, pulse the A relay under each of the loop conditions listed in Table 5—3 and compare the listed readings with the readings observed on the 8600 System readout. The readings listed in the table are not to be considered as absolute limits, however the majority of A relays should operate within these values.

Table 5—3. Model 8674 A Relay Pulse Readings.

PULSING	CONDITIONING		EXPECTED READING
	LEAK	LOOP RES	
60% at 12 PPS	LK A	0 LOOP	40% to 50% BREAK
68% at 12 PPS	NORMAL	1400 LOOP	80% to 87% BREAK
60% at 12 PPS	LK A	1200 LOOP	55% to 65% BREAK

SECTION 6

ELECTRONIC PARTS LIST

6.1 **INTRODUCTION.**

6.2 This section provides the parts list for the Model 8674 Signaling Adapter.

Table 6—1. Model 8674 Overall Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
A1	PRACT ASSY 96609 LOGEN						A008674013
A2	PRACT ASSY 96260 RESIS						A008674014
A3	PRACT ASSY 96254 INTFC						A008674015
A4	PRACT ASSY 96261 BCD						A008674016
C1	.1UF		CD	75V	CENTRALAB	DDA-104	330201040
CR1	D041			200V	HORIZON	1N4003	560040030
DS1-2	T-2 SLIDE BASE				SYL	60A	730000200
DS3	BI-PIN CARTRIDGE				SYL	61	730000300
F1	FUSE 3AG				LITTELFUSE	3AG	863100400
J1-4	JACK,TEL,SCHEM 15				SWCRFT	SEE DWG	650403300
J5	JACK,TEL,SWCRFT SCHEM 8				SWCRFT	M443B	650300100
K1	IC PC 2-.2K A-RELAY				AE	PR-1610-A4	600300100
Q1	TO66LPA	25W		55V	RCA	2N3054	550030540
Q2	TO-3			5V	FAIRCHILD	7805KC	500078051
R1-2	1K	3W	5%		W LEONARD	TYPE 3X	210301025
R3-4	2K	3W	5%		W LEONARD	TYPE 3X	210302025
RT1	LAMP,RES,2 13A FILAMENTS				SYL	GB11B	730100500
RT2	LAMP,RES,BI-PIN				SYL	GB-13A	730100100
RV1	VARISTOR MET OXIDE				GE	V250LA4	565500250
S1-2	SW,LEVER,4C-4C				SWCRFT	60324L	630600500
S3-4	SW,LEVER,2C-2C				SWCRFT	60312L	630600400
S5	SW,LEVER,4C-4C				SWCRFT	60324L	630600500
S6	DPDT	5A		28V	C+K COMP	7201P	620400600
S7	SPDT	5A		28V	C+K COMP	7101P	620400100
S12	SW,LEVER,2C-2C				SWCRFT	60312L	630600400
S13	2D 1CKT 11POS NONSHORT				CRL	PA-1005	625100600
S14	2D 1CKT 12 POS NONSHORT				CRL	PA-2005	625201100
S15	DIAL,TEL.				A.E	D-84821-C	836000100
S17	1D 1CKT 11POS NONSHORT				CRL	PA-1001	625101700
S18	DPDT	5A		28V	C+K COMP	7201P	620400600
S19-20	DPDT BLK MINI				GRAYHILL	46206LFR	635500200
S21	DPDT	5A		28V	C+K COMP	7201P	620400600
TS1	2 CONTACT				CINCH	2-140Y	850002900
W1	CABLE ASSEMBLY						A008674010
W2	HARNESS LAYOUT						A008674012
XDS1-2					DIALCO	105-4428-0722-200	828000200
XDS3	SOCKET,CART LAMP,LONG				SYL	SM-2	828001400
XF1	FUSEHOLDER,3AG PANEL				BUSSMAN	HKP	863000100

Table 6—2. Model 8674 PC1 Line and Generator Board Assembly 96609 Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
C1	20UF			50V	SPRAGUE	TE1305	300202061
C2	.1UF		CO	75V	CENTRALAB	DDA-104	330201040
C3	20UF			50V	SPRAGUE	TE1305	300202061
C4	.1UF		1%	100V	F-DYNE	PE11-.1-100-1	322101040
C5-6	.01UF		20%	500V	SPRAGUE	5GAS-S10	330401032
CR1	A-1	400MW	5%	12V	TRNSTRCN	1N759A	562007591
CR2	D041			600V	HORIZON	1N4005	560040050
CR3	D041			200V	HORIZON	1N4003	560040030
CR4-5	D035	500MW		75V	TRNSTRON	1N4148	560041480
CR6	D041			200V	HORIZON	1N4003	560040030
CR7	DO-7	400MW	20%	18V	TRNSTRCN	1N967	562009670
CR8-10	D035	500MW		75V	TRNSTRON	1N4148	560041480
CR11-12	D041			200V	HORIZON	1N4003	560040030
J1	16 DIP				AMP	583560-1	820101000
J6	40DILP				BERG	65268-019	654002900
K1	1C REED PC MINI				MIDTEX	159-178HA1	604101000
Q1	CASE 29	1-5MA		60V	MOTOROLA	2N5463	555005463
Q2	TO92HSS	310MW		40V	MOTOROLA	2N3903	550039030
Q3	AUDIO DRIVER/OUTPUT				MOTOROLA	MPS-A06	550000060
Q4	TRANSISTOR PUP				MOTOROLA	MPS A-56	552000560
Q5	CASE 29	1-5MA		60V	MOTOROLA	2N5463	555005463
Q6	AUDIO DRIVER/OUTPUT				MOTOROLA	MPS-A06	550000060
Q7	TO92HSS	310MW		40V	MOTOROLA	2N3903	550039030
Q8	AUDIO DRIVER/OUTPUT				MOTOROLA	MPS-A06	550000060
Q9-10	TO92HSS	310MW		40V	MOTOROLA	2N3903	550039030
Q11-12	AUDIO DRIVER/OUTPUT				MOTOROLA	MPS-A06	550000060
R1	6.8K	1W	10%		AB	TYPE GB	200306826
R2	100K	1/4W	10%		AB	TYPE CB	200101046
R3	5.6M	1/2W	10%		AB	TYPE EB	200205656
R4	180K	1/4W	10%		AB	TYPE CB	200101846
R5	100K	1/4W	10%		AB	TYPE CB	200101046
R6	68K	1/4W	10%		AB	TYPE CB	200106836
R7	100K	1/4W	10%		AB	TYPE CB	200101046
R8	18K	1/4W	10%		AB	TYPE CB	200101836
R9	10K	1/4W	10%		AB	TYPE CB	200101036
R10-11	100K	1/4W	10%		AB	TYPE CB	200101046
R12	47K	1/4W	10%		AB	TYPE CB	200104736
R13	10K	1/4W	10%		AB	TYPE CB	200101036
R14	220K	1/4W	10%		AB	TYPE CB	200102246
R15	100K	1/4W	10%		AB	TYPE CB	200101046
R16	18K	1/4W	10%		AB	TYPE CB	200101836
R17	1K	3W	5%		W LEONARD	TYPE 3X	210301025
R18	10K	1/4W	10%		AB	TYPE CB	200101036
R19	6.8K	1W	10%		AB	TYPE GB	200306826
R20	10K	1/4W	10%		AB	TYPE CB	200101036
R21	1.2K	1/4W	10%		AB	TYPE CB	200101226
R22-23	100K	1/4W	10%		AB	TYPE CB	200101046
R24	180K	1/4W	10%		AB	TYPE CB	200101846
R25-26	5K	.75W	10		HELIPOT	89PR5K	232505020

Table 6—2 (cont'd).

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
R27-29	2K	.75W	10		HELIPOT	89PR2K	232502020
R30-31	1K	.75W	10		HELIPOT	89PR1K	232501020
R32	15.4K	1/8W	1%		ELECTRA	MF5C	220215421
R33	9090-	1/8W	1%		ELECTRA	MF5C	220290911
R34	7870-	1/8W	1%		ELECTRA	MF5C	220278711
R35	6040-	1/8W	1%		ELECTRA	MF5C	220260411
R36	4750-	1/8W	1%		ELECTRA	MF5C	220247511
R37	4420-	1/8W	1%		ELECTRA	MF5C	220244211
R38	2870-	1/8W	1%		ELECTRA	MF5C	220228711
R39	453-	1/8W	1%		ELECTRA	MF5C	220245301
R40	4.7K	1/4W	10%		AB	TYPE CB	200104726
R41	1K	1/4W	10%		AB	TYPE CB	200101026
R42	2.7K	1/4W	10%		AB	TYPE CB	200102726
R43	1K	3W	5%		W LEONARD	TYPE 3X	210301025
R44-45	560-	1/2W	10%		AB	TYPE EB	200205616
R46	27K	1/4W	10%		AB	TYPE CB	200102736
RV1	VARISTOR MET OXIDE				GE	V250LA4	565500250
U1	IC,ONE-SHOT TIMER 8DILP				SIGNETICS	NE 555V	510005550
U2-3	14DILP				TI	SN7490N	510074900
U4-5	16PDIL				AB	SN74L85N	510074851
XU1	SKT IC LOW PROF 8PDIL				AMP	583640-1	820000400
XU2-3	14PDIL				AMP	583527 1	820100300
XU4-5	16 DIP				AMP	583560-1	820101000

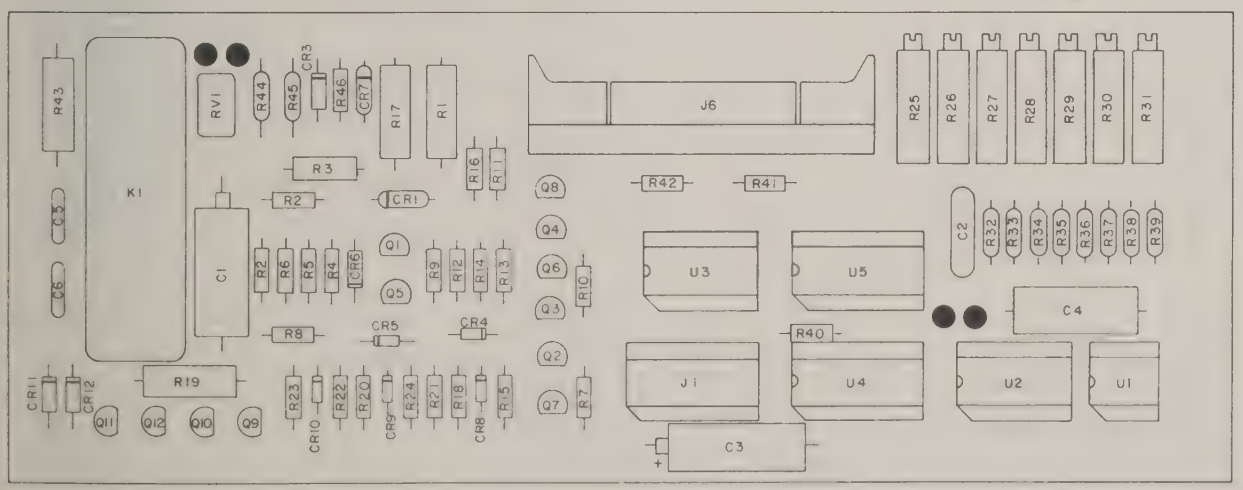


Figure 6—1. Model 8674 PC1 Line and Generator Board Assembly 96609 Parts Location Diagram.

Table 6—3. Model 8674 PC2 Resistor Board Assembly 96260 Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
C1	.15UF		10%	100V	SPRAGUE	225P15491XD3	320001540
C2	2UF			200V	F-DYNE	D-2.0-200-10	301302050
C3	10UF			150V	SPRAGUE	TE1507	300201062
CR1-3	D041			200V	HORIZON	1N4003	560040030
J7	52DILP				BERG	65268-003	654003000
R1	100-	10W	5%		W LEONARD	TYPE 10XM	210601010
R2	200-	10W	5%		W LEONARD	TYPE 10XM	210602015
R3	300#	3W	5%		W LEONARD	TYPE 3X	210303015
R4	400#	3W	5%		W LEONARD	TYPE 3X	210304015
R5	500#	3W	5%		W LEONARD	TYPE 3X	210305015
R6	600#	3W	5%		W LEONARD	TYPE 3X	210306015
R7	700-	3W	5%		W LEONARD	TYPE 3X	210307015
R8	750#	3W	5%		OHMITE	4418	210307515
R9	800#	3W	5%		W LEONARD	TYPE 3X	210308015
R10	900#	3W	5%		W LEONARD	TYPE 3X	210309015
R11	1K	3W	5%		W LEONARD	TYPE 3X	210301025
R12	100-	10W	5%		W LEONARD	TYPE 10XM	210601010
R13	200-	10W	5%		W LEONARD	TYPE 10XM	210602015
R14	300#	3W	5%		W LEONARD	TYPE 3X	210303015
R15	400#	3W	5%		W LEONARD	TYPE 3X	210304015
R16	500#	3W	5%		W LEONARD	TYPE 3X	210305015
R17	600#	3W	5%		W LEONARD	TYPE 3X	210306015
R18	700-	3W	5%		W LEONARD	TYPE 3X	210307015
R19	750#	3W	5%		OHMITE	4418	210307515
R20	800#	3W	5%		W LEONARD	TYPE 3X	210308015
R21	900#	3W	5%		W LEONARD	TYPE 3X	210309015
R22	1K	3W	5%		W LEONARD	TYPE 3X	210301025
R23	10.25K	3W	1%		TEL LAB	EL2B	210310221
R24	10K	3W	1%		TEL LAB	EL2B	210310021
R24				** NO FIXED **			210310025
R25	15K	3W	1%		TEL LAB	EL2B	210301531
R26	4.45K	3W	1%		TEL LAB	EL2B	210344511
R27	600#	3W	5%		W LEONARD	TYPE 3X	210306015
R28-29	400#	10W	5%		W LEONARD	TYPE 10XM	210604015
R30	100#	5W	5%		W LEONARD	TYPE 5XM	210401015
R31	200-	10W	5%		W LEONARD	TYPE 10XM	210602015
R32				** NO FIXED **			210601025
R32	1K	11W	5%		OHMITE	99510A4823	210701025

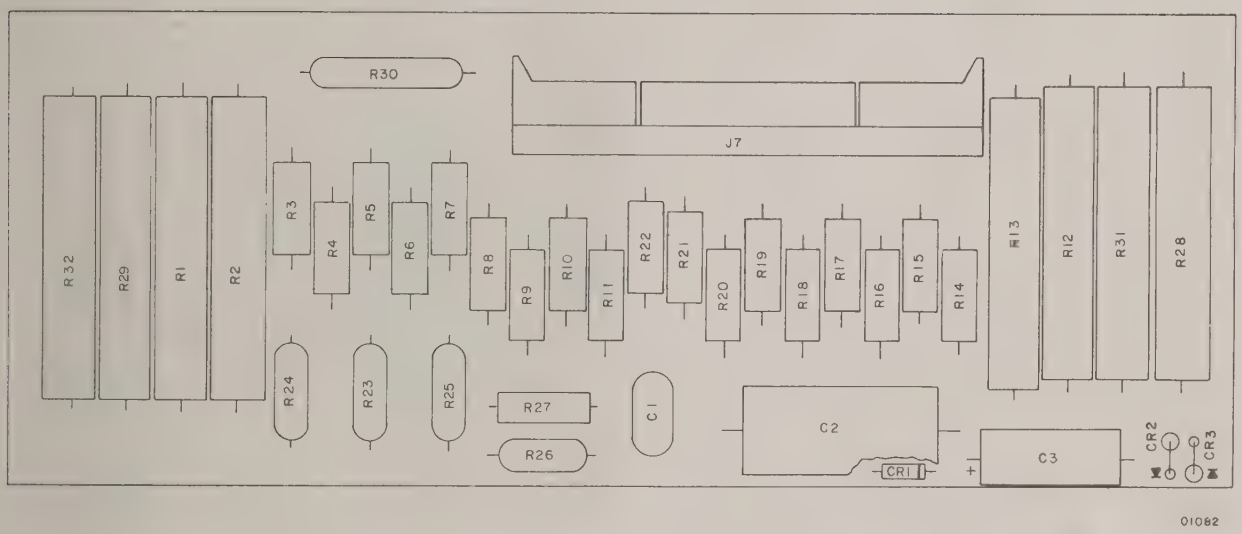


Figure 6—2. Model 8674 PC2 Resistor Board Assembly 96260 Parts Location diagram.

Table 6—4. Model 8674 PC3 Interface Board Assembly 96254 Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
C1	1UF		5%	80V	F-DYNE	MPC12-1.0-80-5	321801055
C2	.18UF		10%	100V	SPRAGUE	225P18491XD3	320001840
C3	.1UF		00	75V	CENTRALAB	DDA-104	330201040
C4	10UF			16V	SPRAGUE	TE1155	300201060
CR1	D041			200V	HORIZON	1N4003	560040030
J1-2	20PIN	STUFFED			ELCO	8016-020-296-707	653205900
K1	6C PC TYPE H				AE-NIPPON	PD1400A22-MR11N58	600600500
Q1-2	TO92HSS	310MW		40V	MOTOROLA	2N3903	550039030
R1	3.9K	3W	5%		W LECNARD	TYPE 3X	210303925
R2	10K	1/4W	10%		AB	TYPE CB	200101036
R3	5.6K	1/4W	10%		AB	TYPE CB	200105626
R4	4.7K	1/4W	10%		AB	TYPE CB	200104726
R5	10K	1/4W	10%		AB	TYPE CB	200101036
R6	20K	1/8W	1%		ELECTRA	MF5C	220220021
R7	20K	.75W	10		HELIPOT	89PR20K	232502030
R8	100K	.75W	10		HELIPOT	89PR100K	232501040
R9	49.9K	1/8W	1%		ELECTRA	MF5C	220249921
R10	4.7K	1/4W	10%		AB	TYPE CB	200104726
R11	5.6K	1/4W	10%		AB	TYPE CB	200105626
R12	27-	1/4W	10%		AB	TYPE CB	200102706
R13	5.6K	1/4W	10%		AB	TYPE CB	200105626
R14	27-	1/4W	10%		AB	TYPE CB	200102706
U1	6DILP				SIEMENS	CNY17/IV	515000400
U2	DUAL RESET.MONO MULTIVIB				FAIRCHILD	96L02PC	510509602
U3	14DILP	L/P			TI	SN74L03N	510507403
XU1	6DILP				CAMBION	703-3771-01-04-16	820101800
XU2	16 DIP				AMP	583560-1	820101000
XU3	14PDIL				AMP	583527 1	820100300

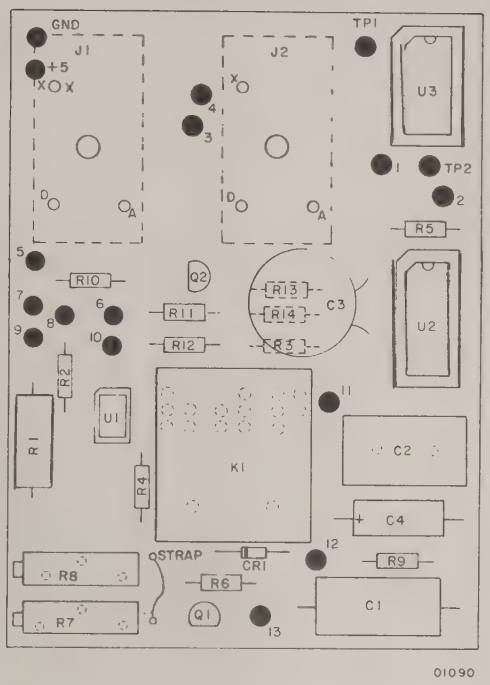
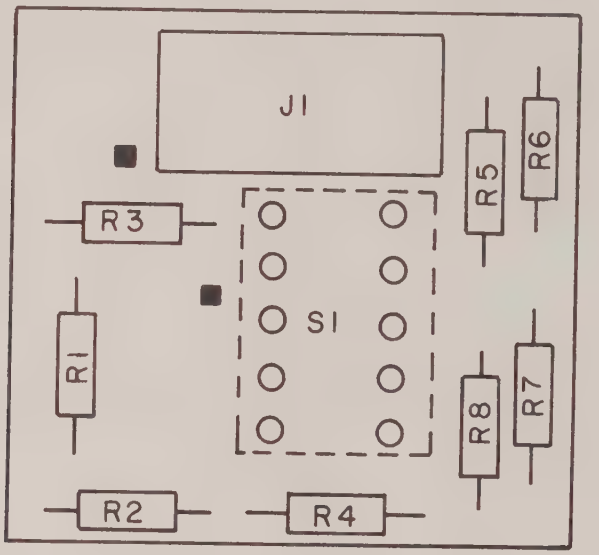


Figure 6—3. Model 8674 PC3 Interface Board Assembly 96254 Parts Location Diagram.

Table 6—5. Model 8674 PC4 BCD Switch Board Assembly 96261 Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
J1	16 DIP				AMP	583560-1	820101000
R1-8	4.7K	1/4W	10%		AB	TYPE CB	200104726
S16	SW THMBWHL BCD COMPL				DIGITRAN	29119-2P	626800500



01089

Figure 6—4. Model 8674 PC4 BCD Switch Assembly 96261 Parts Location Diagram.

Table 6—6. Model 8674 Cable Assembly B0086-74-010 Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
P3	16PD/L				3M CO	3416	653800500
P4	16PD/L				3M CO	3416	653800500

Table 6—7. Model 8674 Harness Layout Assembly C0086-74-012 Parts List.

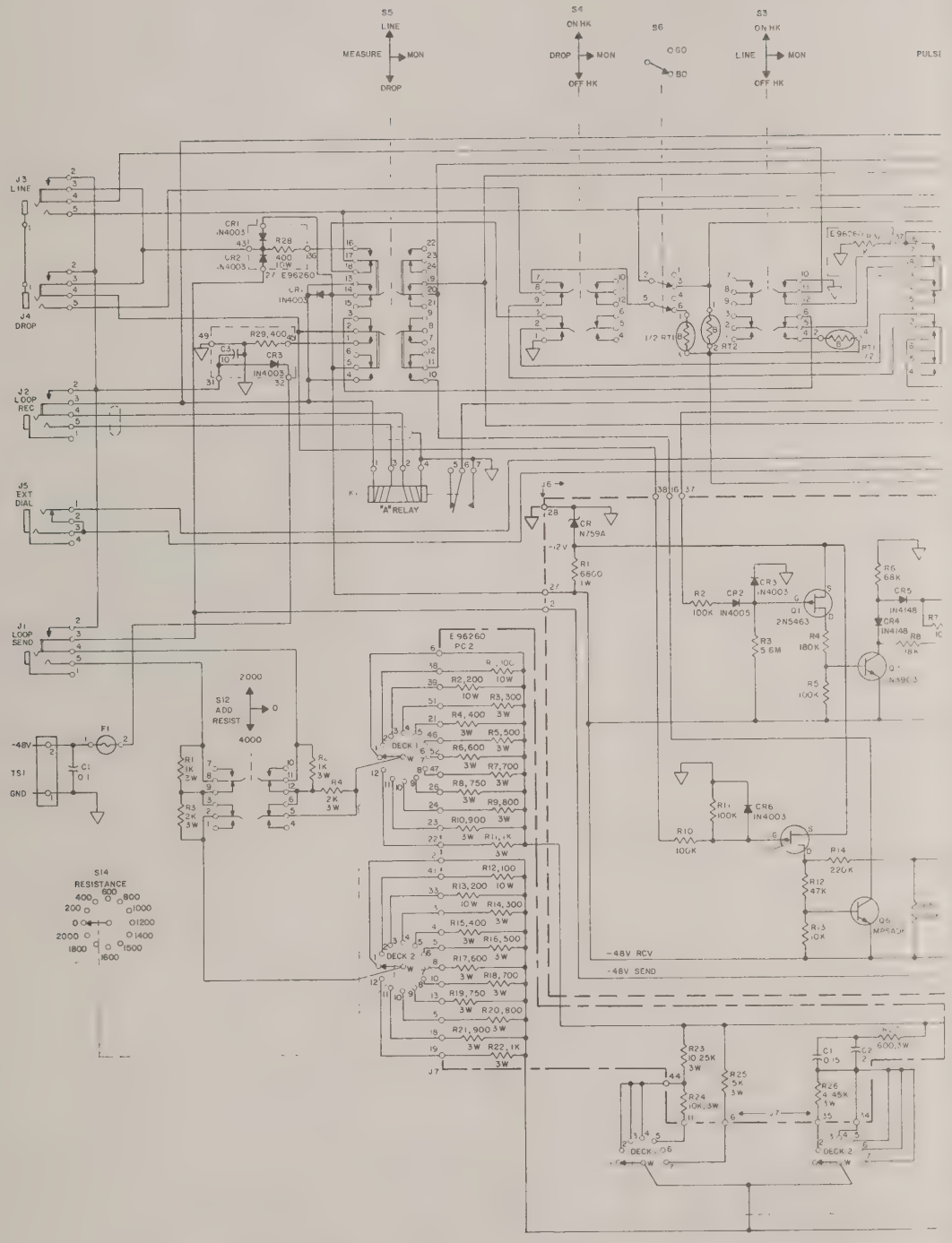
REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
P1	40DILP				BERG	65043-017	652001700
P2	52DILP				BERG	65043-011	652001800

SECTION 7

SCHEMATIC DIAGRAMS

7.1 INTRODUCTION.

7.2 This section provides the schematic diagrams for the Model 8674 Signaling Adapter.



NOTES:
1. UNLESS OTHERWISE INDICATED:
   RESISTOR VALUES ARE IN OHMS
   CAPACITOR VALUES ARE IN MICROFARADS

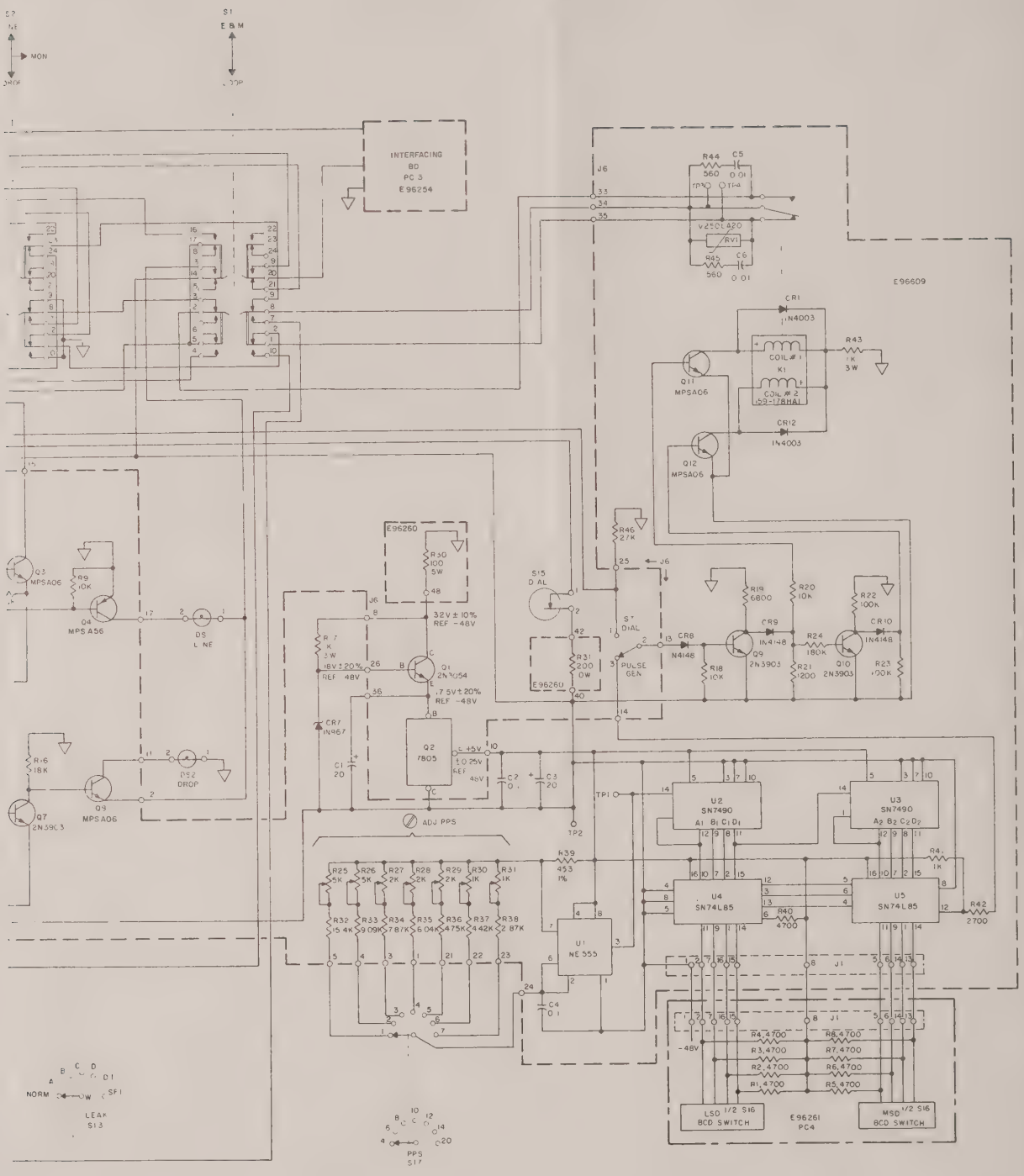
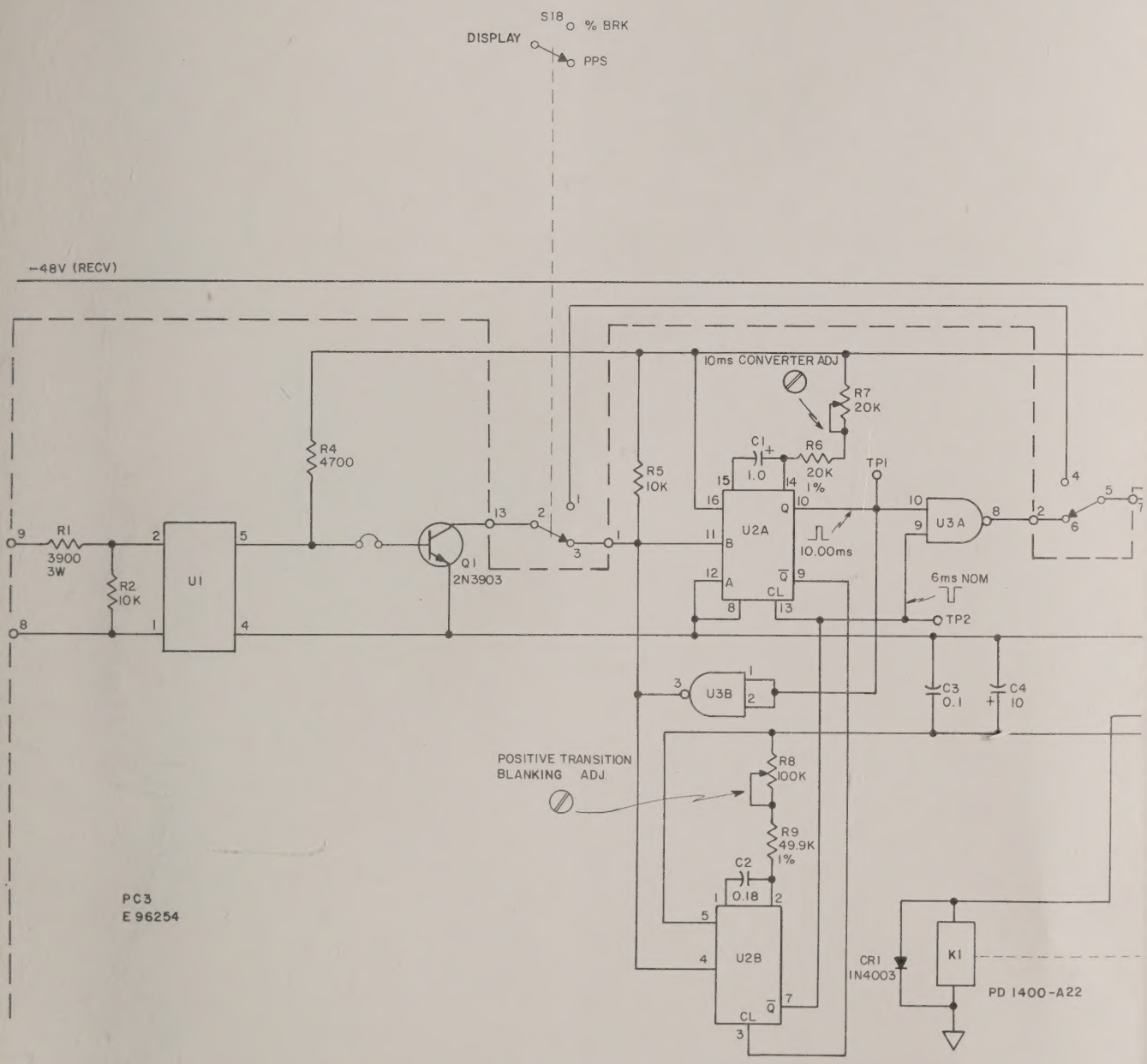
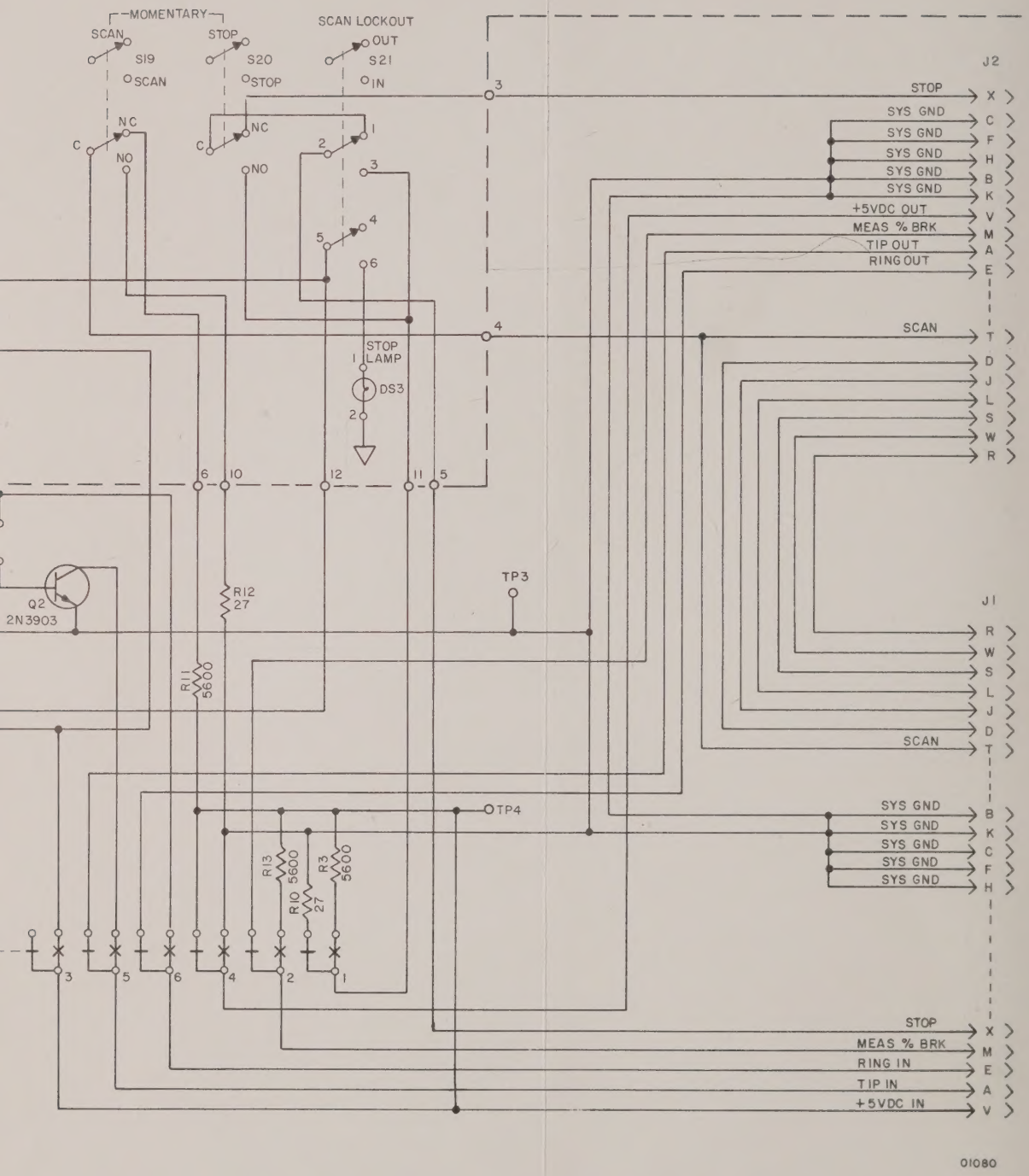


Figure 7—1. Model 8674 Overall Schematic Diagram.



I.C.	TYPE	GND	+5V
U3	74L03	14	7
U2	96L02	16	8
U1	CNY 17/ IV	OPTO.ISOL.	

NOTES:
1. UNLESS OTHERWISE INDICAT
RESISTOR VALUES ARE IN OH
CAPACITOR VALUES ARE IN M



ROFARADS.

Figure 7—2. Model 8674 Interfacing Circuit, Schematic Diagram.

85452